

ML2870A DATA SHEET [DIGEST VERSION]

16-Tone, 32-Poly Hi-Grade PCM Sound Generator LSI

Version **1.0.1**

GENERAL DESCRIPTION

ML2870A is a PCM-based hi-grade sound generator LSI, developed specifically for music ringers as used in cellular/PHS phones. With an on-chip high-quality General MIDI sound set, ML2870A is capable of playing 16 tones and 32 polyphonies simultaneously. Using the on-chip three FIFOs which store musical score data, MIDI message and ADPCM audio data, a fantastic music ringer subsystem can readily be built around this chip.

FEATURES

- 1) Supports GM System level 1
- 2) On-chip high-quality GM sound set (128 timbres + 47 percussions embedded)
- 3) 16 timbres, 32 polyphonies simultaneously (default setting is 24)
- 4) 5V open drain ports with current control for vibrator, front panel light, LED x 4
- 5) 3-wire serial / 8-bit parallel bus selectable
- 6) FIFO embedded for CPU power reduction
- 7) Power down current: 2 μ A (typ.)
- 8) Operating current: 36mA (max.)
- 9) Power supply: +2.5 ~ 3.6V
- 10) Operating temperature: -20 ~ +85°C

APPLICATION EXAMPLES

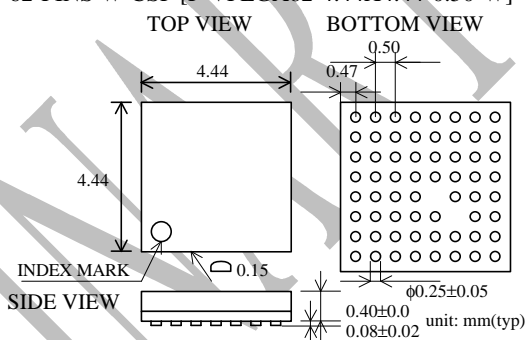
Mobile phone, PHS, Fax, PDA etc...

(Note)

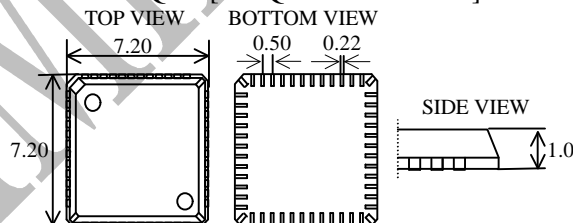
Please appreciate that ML2870A is not offered for musical instrument.

PACKAGE SPECIFICATION

62-PINS W-CSP [P-VFLGA62-4.44X4.44-0.50-W]



48-PINS QFN [P-VQFN48-0707-0.50]



DIFFERENCE BETWEEN ML2860 AND ML2870A

	ML2860	ML2870A
Sound Generator	GM Sound Generator 128 Timbre + 47percussions	GM Sound Generator 128 Timbre + 47percussions
Multi-Timbre	16 channels 32 polyphony	16 channels 32 polyphony
Wavetable size	4	1
Software Compatibility	Compatible except analog	
Output Audio Channel	Stereo	Stereo
External Analog Input	Embedded	-
Speaker Amplifier	Headphone amp embedded	-
ADPCM Playback	Available	Available
Supply voltage	+2.7 ~ 3.3V	+2.5 ~ 3.6V
CPU I/F	Synchronous serial I/F & 8bit Bus I/F embedded (+1.65 ~ 3.3V)	
Package size	WCSP6.26 x 5.98 mm 64-TQFP 12 x 12mm (incl. lead)	WCSP4.44 x 4.44 mm 48-QFN 7x7mm (incl. lead)
Schedule	In Volume Production	In Volume Production
Demo Board	In Volume Production	In Volume Production

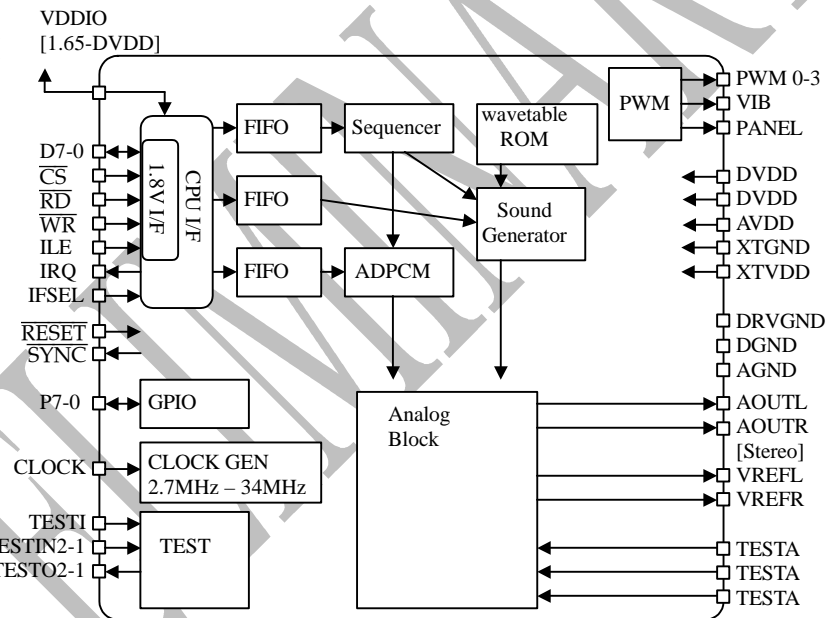
ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Rating	Unit
Supply Voltage	VDD	Ta=25°C	-0.3 - +5.0	V
Input Voltage 1 *1	VIN		-0.3 - VDD+0.3	V
Power Dissipation	Pd		140	°C/W
Storage Temperature	TSTG	-	-55 - +125	°C

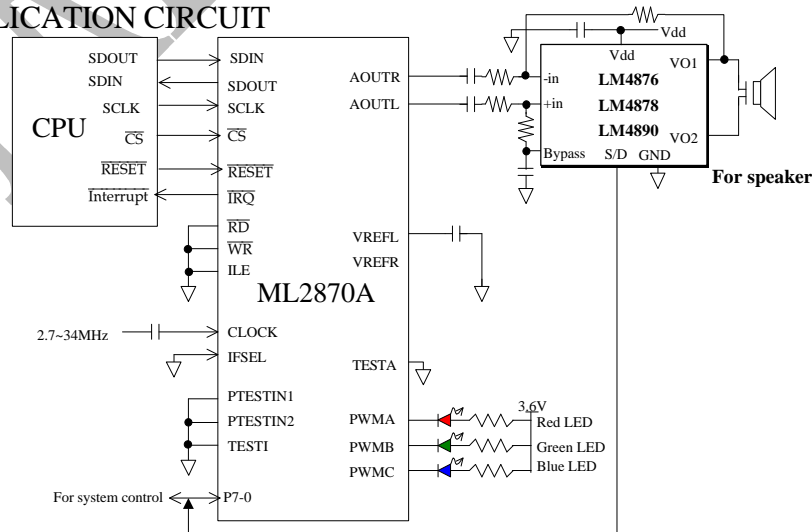
RECOMMENDED OPERATING RANGES

Parameter	Symbol	Condition	Rating	Unit
Supply Voltage	DVDD	DGND=AGND=0V	2.5 - 3.6	V
Supply Voltage	AVDD	DGND=AGND=0V	DVDD	V
Supply Voltage	VDDIO	DGND=AGND=0V Bus Interface	1.65-DVDD	V
Supply Voltage	VDDIO	DGND=AGND=0V Serial Interface	DVDD	V
Supply Voltage	XTVDD	DGND=XTGND=0V	DVDD	V
Operating Temperature	TOP	-	-20 - +85	°C
Master clock frequency	fCLK	-	2.7- 34	MHz

BLOCK DIAGRAM



TYPICAL APPLICATION CIRCUIT



SOFTWARE SUPPORT (SUBJECT TO AN NON DISCLOSURE AGREEMENT)

- a.) Support software for Standard MIDI file format 0/1 playback.
- b.) Support software for MCDF (Oki original musical score format) playback.
 - MCDF: 1) File size compression of musical score from Standard MIDI file
 - 2) Expand function for synchronization between picture, text, LED and MIDI.

DC CHARACTERISTICS [OUTLINE]

IOVDD=1.65-DVDD, DVDD=AVDD=+2.5V-3.6V,
DGND=AGND=XTGND=DrvGND=0V, Ta=-20-+85°C

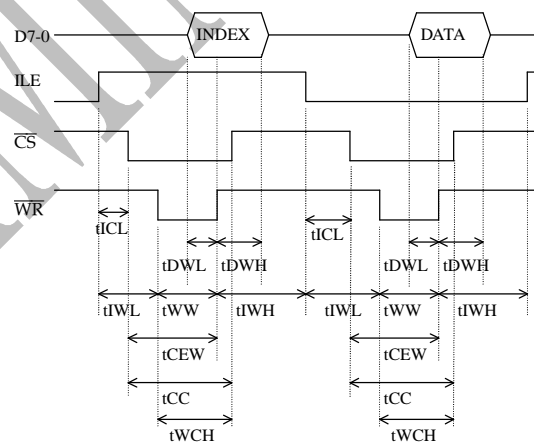
Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
“H” Input Voltage	VIH	DGND=AGND=0V	VDD x 0.8	-	-	V
“L” Input Voltage	VIL	-	-	-	VDD x 0.2	V
“H” Output Voltage	VOH	IOH=-135µA	VDDx0.8	-	-	V
“L” Output Voltage	VOL	IOL=135µA	-	-	VDDx0.2	V
tICL “H” Input Current	IIH	VIH=VDD	-	-	10	µA
“L” Input Current	IIL	VIL=0V	-10	-	-	µA
Operating Current	IDDD	Sound generator (Ports no load)	-	22	36	MA
Standby Current	IDDS	Ta=-20-+40°C	-	2	15	µA
		Ta=+40-+50°C	-	-	30	µA
		Ta=+50-+75°C	-	-	130	µA
		Ta=+75-+85°C	-	-	230	µA

AC CHARACTERISTICS / TIMING CHART [OUTLINE]

VDDIO=1.65-DVDD, DVDD=AVDD=XTVD=+2.5V-3.6V,
DGND=AGND=XTGND=DrvGND=0V, Ta=-20-+85°C

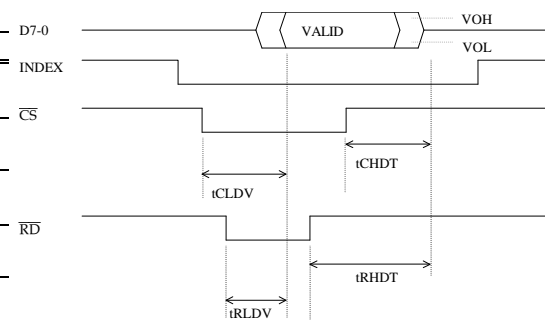
BUS WRITE TIMING

Parameter	Symbol	Min	Max.	Unit
ILE valid to Write Enable Low	tWL	10		ns
ILE valid to Write Enable High	tWH	10		ns
ILE valid to Chip Select Low	tCL	5		ns
Write Enable Pulse Width	tWW	25		ns
Chip Select Pulse Width	tCC	50		ns
Data Valid to Write Enable Low	tDWL	50		ns
Data Valid to Write Enable High	tDWH	0		ns
Write enable Low to Chip Select High	tWCH	25		ns
Chip Select to End of Write	tCEW	50		ns



BUS READ TIMING

Parameter	Symbol	Min	Max.	Unit
Read Enable Low to Data Valid	tRLDV	-	85	ns
Chip Enable Low to Data Valid	tCLDV	-	85	ns
Read Enable High to Data Transition	tRHDT	-	85	ns
Chip Enable High to Data Transition	tCHDT	-	85	ns

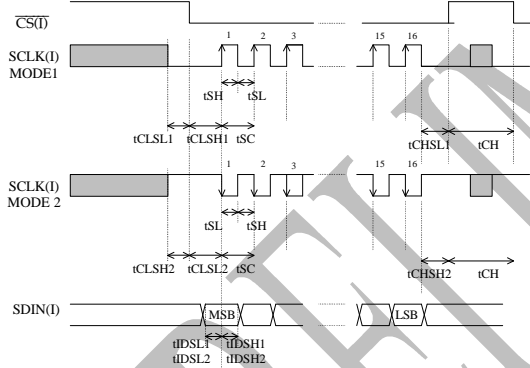


SERIAL INTERFACE

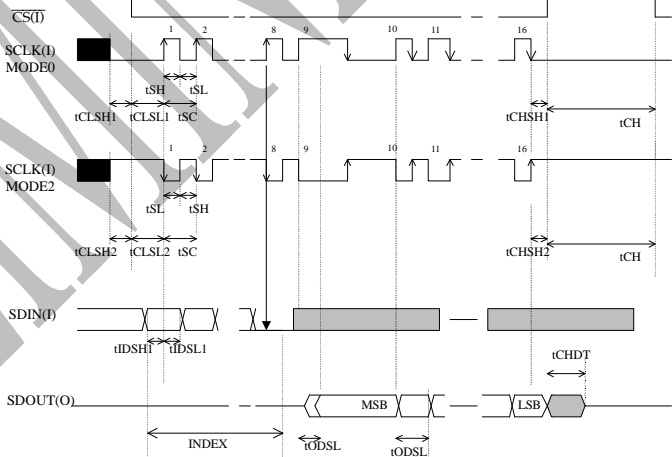
VDDIO=1.65-DVDD, DVDD=AVDD=XTVD=+2.5V-3.6V,
 DGND=AGND=XTGND=DrvGND=0V, Ta=-20+85°C

Parameter	Symbol	Min	Max.	Unit
Chip Select Low to SCLK Low 1	tCLSL1	100	-	ns
Chip Select Low to SCLK Low 2	tCLSL2	50	-	ns
Chip Select Low to SCLK High 1	tCLSH1	100	-	ns
Chip Select Low to SCLK High 2	tCLSH2	50	-	ns
SCLK High Pulse Width	tSH	50	-	ns
SCLK Low Pulse Width	tSL	50	-	ns
SCLK Cycle Time	tSC	100	-	ns
Input Data Valid to SCLK Low1	tIDSL1	30	-	ns
Input Data Valid to SCLK Low2	tIDSL2	30	-	ns
Input Data Valid to SCLK High1	tIDSH1	30	-	ns
Input Data Valid to SCLK High2	tIDSH2	30	-	ns
Chip Select High to SCLK Low 1	tCHSL1	0	-	ns
Chip Select High to SCLK High 2	tCHSH2	0	-	ns
Chip Select High Pulse Width	tCH	50	-	ns
Output Data Valid to SCLK Low 1	tODSL1	-	40	ns
Output Data Valid to SCLK High 2	tODSH2	-	40	ns
Chip Enable High to Data Transition	tCHDT	-	40	ns
RST High to Chip Select Low	tRSC	180	-	ns
RST Pulse Width	tRST	1	-	μs
Initialize Time	tINIT	-	40	ms

DATA Write Timing



Data Read Timing



FREQUENTLY ASKED QUESTIONS

- Q1. What kind of musical score formats does the ML2870A support?
 A1. ML2870A can play Standard MIDI files under given conditions and the Oki original musical score format directly. If Standard MIDI file format 1/0 or Karaoke function need to be supported, Oki provides sample software based on NDA for this purpose.
- Q2. What is the condition for playing Standard MIDI file directly?
 A2.
 (1) Play format 0 only, do not play format 1.
 (2) Eliminate text and MIDI events not supported by the ML2870A.
- Q3. Which MIDI events does the ML2870A support?
 A3.
 - Note On/Off / Program change / Pitch bend / Channel pressure
 - Control change [Modulation / Volume / Pan / Expression / Sustain / Reset all controller / All note off]
 - RPN [Pitch bend sensitivity / Fine tuning / Coarse tuning]
- Q4. Does the ML2870A support synchronization of LED with ADPCM playback ?
 A4. Yes. LED and ADPCM functions are included in the musical score and are assigned as percussion to MIDI channel 10. It is necessary to build a software routine for this synchronization.